

Overall Cost Update

I know it's late, so this is only a
very broad brush overview,
not endless spreadsheets

First, an admission!

- I have gone back and updated the TASD cost estimate
- I found an error in the June, 2004 version
 - This is the danger when only one guy looks at it
 - Throughout this talk, keep in mind it's still just one guy....
- The error:
 - I included the cost of mixing the scintillator as provided by Stuart Mufson, BUT I did not then take any cost savings on the components when purchased separately – actually I don't think we knew a number for the components in June?
 - So I added \$4.4M mixing quote but did not save anything, let alone the \$8.6M savings quote we now have on raw components.
- Therefore TASD was overpriced by 6% in Appendix B of our proposal
- I have also now inserted
 - the cost of Jostlein's block raiser,
 - credited for a cheaper crane
 - the new PVC wall thicknesses so it is only 77% active

REVISED TASD is \$ 150.0 M, only 2% higher than the baseline

		50 kT		25 kT		REVISED	
		Liquid		Totally Active		Totally Active	
		Scintillator		Scintillator		Scintillator	
		Baseline		Detector		Detector	
WBS	Description	Base Cost	Sub-total with overhead & contingency	Base Cost	Sub-total with overhead & contingency	Base Cost	Sub-total with overhead & contingency
1.0	Near Detector	2,152,582	5,166,198	3,576,039	8,582,494	2,789,602	6,695,045
2.0	Far Detector						
2.1	Absorber	12,618,525	16,804,304	0	0	0	0
2.2	Active Detector	28,324,540	39,023,945	63,085,322	84,321,021	55,299,418	75,390,395
2.3	FEE, Trigger and DAQ	6,375,205	10,945,290	8,335,880	14,220,877	8,567,952	14,609,372
2.4	Shipping&Customs Charges	5,421,343	7,860,947	4,290,330	6,220,979	3,886,054	5,634,778
2.5	Installation	11,789,067	20,520,401	6,050,554	10,513,009	7,307,247	12,745,831
	Detector Sub-total	64,528,679	95,154,888	81,762,086	115,275,886	75,060,671	108,380,376
3.0	Building and Outfitting						
3.1	Building	16,634,800	27,105,127	12,093,380	19,705,232	12,534,080	20,423,319
3.2	Outfitting	4,745,748	9,776,240	4,589,748	9,454,880	4,137,756	8,523,778
	Building and Outfitting Sub-total	21,380,548	36,881,367	16,683,128	29,160,112	16,671,836	28,947,097
4.0	Active Shield	1,602,882	4,039,262	0	0	0	0
5.0	Project Management	3,935,000	6,024,780	3,935,000	6,024,780	3,935,000	6,024,780
TPC	Total Project Cost	93,599,690	147,266,495	105,956,253	159,043,273	98,457,109	150,047,299
	Sanity Check						
	Project Mgt	4%		4%		4%	
	Overhead	10%		7%		9%	
	Contingency	43%		40%		40%	

TASD may be cheaper yet

- Stan made a good case for a cheaper Near Detector at our meeting in October
- **Stan estimated (for 80 tons fiducial)**
 - **\$1M in base costs + \$1M in contingency**
 - I haven't had a chance to check this or insert it into the spreadsheet, so
- **The previous page still has a Near Detector cost + contingency of \$6.6M**

What about the 9 foot high version of 53 foot long modules?

- Added Costs
 - The modules themselves
 - But the biggest effect is that the vertical electronics channel count gets multiplied by 6 since there are 6 stacked modules
- There are cost savings also
 - Less fiber since shorter vertical cells have much less attenuation in the fiber
 - Less assembly labor at the far site
- Cost neutrals
 - More PVC modules to assemble, but that gets offset by simpler assembly for the short vertical ones

Rough Cost Outline for 9ft x 53ft Modules

- Delta \$ relative to TASD (for base + overhead + labor + contingency)
 - This would have to be checked for reality

Item	Delta cost (\$M)	comment
Containers	+ 11	Obviously a new cost
Modules	0	3 factories, 3.71 yrs, now 2 horizontal + 6 vert factories, 2.4 yrs
Fiber	- 7	Vertical cells need only one & its cheaper
Scintillator	0	
Electronics	+ 26	6x vertical cells
Shipping	0	
Installation	- 8	Crew of 11 vs 31, 1.5 yrs vs. 2.25 yrs, no glue
Building	- 4	Credit, already sized for overburden, reduce contingency
Outfitting	- 4	Credit, automatic secondary containment
TOTAL	+ 14	About 10% more than monolithic TASD

And for the double high 18 foot version of 53 foot long modules?

- Added Costs
 - The modules themselves again, but no more expensive
 - Now the vertical electronics channel count gets multiplied by “only” 3 since there are 3 stacked modules
- But there are cost savings also
 - Same effect of less fiber since shorter vertical cells have much less attenuation in the fiber
 - Less assembly labor at the far site, but more than in the 9 foot case since many parts get manipulated.
- Cost neutrals
 - More PVC modules to assemble, but not as many as in the 9 foot case. But the assembly for short 18 foot ones is harder?

The 18 foot alternate, similar but cheaper

- Delta \$ relative to TASD
 - Base + overhead + labor + contingency
 - This would have to be checked for reality

Item	Delta cost (\$M)	comment
Containers	+10	Obviously a new cost, a little cheaper for 18 ft
Modules	0	
Fiber	- 8	Vertical cells need only one, it's still as cheap as the 9 ft, and there are fewer manifold ends
Scintillator	0	
Electronics	+9	Now only 3x vertical cells
Shipping	0	
Installation	- 6	Crew of 17 vs 31, 1.7 yrs vs. 2.25 yrs, no glue
Building	- 4	Credit, already sized for overburden, reduce contingency, bldg very close to 9 ft version
Outfitting	- 4	Credit, auto secondary containment
TOTAL	- 3	About equal to monolithic TASD

Observations

- The costs of these three schemes are quite similar
 - \$ 150 M, \$ 165 M, \$ 147 M
 - But we need to check the one we write up in more detail
 - The factory labor and Far Site labor in particular need serious thought
- The contingency on all versions is about 40%
 - We should bump this up to 50% given the state of our understanding today
 - Many of our quotes are now out of date on oil related items....
- Should we add in the complete cost of an overburden, or tough it out defending a cosmic ray Monte Carlo?
 - We will never satisfy some critics with a Monte Carlo when we once promised an actual test.
 - This was written before Leon's talk, so maybe I'm convinced by now?
 - It's not cheap
 - Maybe \$ 50 M for 1.2 m steel (=3 m earth) in the modular version
 - » Probably cheaper to make a robust container and not use solid steel?
 - Unknown \$ for a building supporting only 3m, but we could probably get some simple help from Fermilab on scaling the CNA design down.